

REMARKS

Claims 1, 3, 5, 6, 9, 10, 12, 13 and 16 -18 are pending in the application. Claims 7, 8, 11, 14 and 15 have been withdrawn from consideration. By this amendment, claims 1, 3, 5 and 6 are amended. The Examiner incorrectly included claims 9, 10, 12, and 13 in the restriction requirement. Claims 9 and 10 depend from independent claim 1. Claims 12 and 13 depend from independent claim 5. Applicants submit that these dependent claims should not be restricted, but rather examined. Reconsideration of the rejected claims in view of the following remarks is respectfully requested.

Allowed Claims

Applicants appreciate the indication that claim 6 is allowed. However, Applicants submit that all of the pending claims are in condition for allowance for the following reasons.

Objections

Claim 5 was objected to for no antecedent basis for "the non-magnetic portion." In response claim 5 has been amended to recite, in part "a magnetic portion." The objection over claim 5 should now be withdrawn.

Election

The Examiner restricted claims 7-15 and withdrew these claims from consideration. However, Applicants submit that claims 9, 10, 12, and 13 were improperly included in the restriction as they depend from respective independent claims 1 and 5. Thus, claims 9, 10, 12, and 13 should remain pending and be considered by the Examiner.

35 U.S.C. §102 Rejection

Claims 1 and 3 were rejected under 35 U.S.C. §102(b) for being anticipated by U. S. Patent No. 5,920,139 issued to Fujiwara et al. This rejection is respectfully traversed.

As discussed in the background section of the application, in conventional commutator motors, the stator yoke is structured by stacking steel plates on each other. However, because the conventional permanent magnet commutator motor is small in size, there is a fear that the steel plates are deformed when concave and convex portions are formed on the steel plates for caulking, and it is actually difficult to fix the steel plates by caulking. Also, because the field magnet is disposed on the radially outer side of the stator yoke, the magnetic flux may not be effectively utilized, which lowers performance of the motor.

The invention provides for caulking between a plurality of plate-like annular bodies or arcuate bodies coaxially stacked in the axial direction of the stator yoke. The thickness of the annular body or arcuate body in the axial direction can be set to a minimum, and the number of stacked annular bodies or arcuate bodies is set to a desired number, thereby arbitrarily setting the length of the stator yoke in the axial direction. The plurality of plate-like annular bodies or the plate-like arcuate bodies adjacent to each other in the stacked direction each have a concave portion for mating to a convex portion of an adjacent body and are fixedly connected to each other by caulking the mating concave/convex portions, e.g., reference numeral 11D. At least one pair of convex portions protrude radially inwardly from the inner peripheral surface of the stator yoke holding securely (e.g., by press fitting) the field magnet between the convex portions.

These features are not shown in Fujiwara. In Fujiwara, the plates are stacked upon one another and may be laminated. The Examiner asserts that this lamination is a bonding operation; however, the definition of lamination in regards to metal plating of this industry typically refers to layering of metal plates on one another and not necessarily with bonding. In the Oxford dictionary the definition of "laminating" includes "overlay with metal plates" or "manufacturing by placing layer on layer." Further, Fujiwara discloses that the laminating uses silicon steel sheets (col. 4, ll. 3-4) which Applicants submit is typical when insulating the plates, and not when bonding the plates. This is consistent with Fujiwara's stated aim of eliminating an adhesive in the manufacturing process (col. 5, ll. 49 and 51, col. 7, ll. 2 and 3, and elsewhere). Therefore, Applicants submit that the laminating in Fujiwara is not necessarily, and most likely is not, a bonding operation.

However, to advance the application, Applicants amendment to claim 1 renders this point moot. Claim 1 recites, in part,

wherein at least one pair of convex portions protrude radially inwardly from the inner peripheral surface of the stator yoke holding securely the field magnet between the convex portions. (Emphasis added)

Applicants submit that Fujiwara does not disclose this feature and actually teaches away from this concept. For example, at col. 7, ll. 49-53, Fujiwara discloses:

As a result, the magnet is held only by the portions 36 and 36 formed by laminating a plurality of stator plates 31 having the magnetic insertion holes 50, 51, 52 and 53, and is not held but exposed in the portion formed by laminating the stator core plates 32 not having the magnetic insertion hole. (Emphasis added)

As Figures 8A and 8B show in Fujiwara, two kinds of yokes 31 and 32 are required. Magnetic characteristics may be lowered only by the employment of the yoke 31 (i.e., core plates). Therefore, the yoke 32 is required in order to expose the permanent magnet to the armature. Consequently, in Fujiwara, much labor is required for assembly. Furthermore, high dimensional accuracy is required for the permanent magnet. At column 8, lines 43-446 of Fujiwara, deformation of the yoke (core plates) at one of the distal ends is described for holding the permanent magnet. However, the deformation direction is not the circumferential direction of the yoke, rather it is the stacking direction (or axial direction) of the yoke. In Fujiwara, core plates 31 with the magnetic insertion holes 50-53 are layered (i.e., laminated) with stator plates 32 to hold the magnet 40 between plates 31, designated as portion 36. That is, the magnet 40 is held in place by upper and lower plates 31 (designated as portion 36), and not by plates 32 as disclosed by Fujiwara. Therefore, the convex portions of plates 32 do not hold securely the magnet 40. In contrast, according to the invention of claim 1, a single kind of yoke is provided and the permanent magnet can be fixed or held between the pair of convex portions in the

circumferential direction of the stator yoke. This is different from Fujiwara since Fujiwara does not disclose or suggest holding a field magnet between convex portions; rather the magnet of Fujiwara is held between two plates 31, designated as portion 36. The magnet of Fujiwara might be considered “between” two convex portions, but the magnet of Fujiwara as described in the cited passage (col. 7, ll. 49-53) is specifically not held securely by the convex portions. Rather, the magnet is held by the portion 36 which are upper and lower plates in a cavity formed by plates 32. The invention of claim 1 is distinctly different from this type of plate layering as described by Fujiwara. Therefore, Applicants submit that neither Fujiwara, nor any reference of record, discloses or suggests all of the limitations of claim 1 for at least these reasons.

Accordingly, Applicants respectfully request that the 35 U.S.C. §102 rejection over claims 1 and dependent claim 3 be withdrawn.

35 U.S.C. §103 Rejection

Claim 5 is rejected under 35 U.S.C. §103(a) for being unpatentable over Fujiwara in view of U.S. Patent No. 5,175,460 to Ishizuka (“Ishizuka”). This rejection is respectfully traversed.

In response, claim 5 has been amend to recite, in part:

wherein the plurality of plate-like annular bodies or the plate-like arcuate bodies adjacent to each other in the stacked direction are fixedly connected to each other by caulking, wherein the non-magnetic portion is defined by a hollow groove extending in the axial direction of the stator yoke and formed in the inner peripheral surface of the stator yoke with a depth of the groove extending partially into the stator yoke, (Emphasis added)

As shown in Ishizuka (16 of Fig. 1), the hollow groove is completely formed through the wall of the stator yoke 14. In contrast, the “groove” of the invention of claim 5 is different from the “slit” of Ishizuka. The invention of claim 5 requires “the depth of the groove extending partially into the stator yoke.” An advantage of the “groove” includes when a commutator motor is

subjected to a large vibration amplitude or high frequency vibration, such as a case where the motor is installed in a vibration drill, the fixing force between the stator yoke and the field magnet must be increased. To produce this effect, an adhesive may be used in addition to the at least one pair of convex portions. The groove 41a is quite effective for retaining the adhesive therein. A relatively large volume of adhesive may be retained by increasing the volume (i.e., size) of the groove 41a. On the other hand, it may be impossible to increase the volume of the slit 16 of Ishizuka and any increase in adhesive may leak out radially from the opening of slit 16. Therefore, Applicants submit that since neither Fujiwara nor Ishizuka, either singly or in combination, disclose or suggest all the limitations of claim 5, the 35 U.S.C. §103 rejection should now be withdrawn.

A rejection under 35 U.S.C. § 103 based on obviousness cannot be properly maintained without a proper disclosure of each and every element and the motivation to combine the elements. Here the applied references fail to provide any motivation that would lead one of ordinary skill in the art to combine the references in a manner set forth in the Official Action. Accordingly, the Examiner is respectfully requested to withdraw the rejection under 35 U.S.C. § 103.

Support for Amendments

Support for the amendment to claim 1 may be found at least at page 13, lines 14-20 and page 14, lines 14-17, where it states that the magnet is held securely (e.g., press fitted) by convex portions of the stator yoke. Support for the amendment to claim 5 may be found at least at page 11, line 20 to page 12, line 8 and Figs. 2 and 3. The amendment to claim 3 removes unnecessary language.

Additionally, minor amendments have been made to claims 1, 5 and 6 in order to improve the language thereof. In these amendments, Applicants have made several changes to the language of the claims to render the same more self consistent, as well as more fully in

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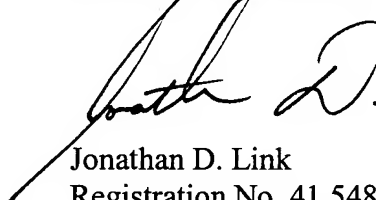
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compliance with U.S. syntax, idiom and grammar. These amendments do not change the scope of the claims but are merely cosmetic changes that give rise to no file wrapper estoppel.

CONCLUSION

In view of the foregoing remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicant hereby makes a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 23-1951.

Respectfully submitted,



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